



INTERNATIONAL
HELLENIC
UNIVERSITY

Regulatory Framework Of Energy Recovery From Municipal Solid Waste

Eleni I. Giovanopoulou

SCHOOL OF ECONOMICS, BUSINESS ADMINISTRATION & LEGAL STUDIES

A thesis submitted for the degree of

***Master of Science (MSc) in LLM in Transnational and European
Commercial Law, Mediation, Arbitration and Energy Law***

January 2016

Thessaloniki – Greece

Student Name: Eleni I. Giovanopoulou
SID: 1104140014
Supervisor: Prof. Theodore Panagos

I hereby declare that the work submitted is mine and that where I have made use of another's work, I have attributed the source(s) according to the Regulations set in the Student's Handbook.

January 2016
Thessaloniki - Greece

Abstract

This dissertation was written as part of the MSc in LLM in Transnational and European Commercial Law, Mediation, Arbitration and Energy Law at the International Hellenic University.

The climate change has been depressing the latest years leading countries' governors to take up actions in order to prevent it. Considering that human activities cause the problem, they concentrated on greenhouse gas emissions. This general target further presupposes the transformation into a low carbon economy, the use of green energy and the effective management of municipal waste. It was recognized from the early beginning that the use of energy from renewable energy sources was the solution. The EU adopted a number of regulations to this direction, the most outstanding of which are the RES, the Landfill and the Waste Management Directives.

The technologies were immature and, therefore, costly, so incentives were given to the investors. Soon the use of RES expanded taking advantage of new technologies. The more controversial was proved the biomass. Although it serves many benefits, it is even more expensive and raises environmental issues. Environmental organizations, in particular in Greece, bring actions against energy generation from municipal waste, impeding its development. As a result, Greek legislation evades to regulate the municipal solid waste as RES, which is contrary to European legislation and worldwide practices. Concluding, there is no due reason neither for the environmental revolution nor for the governments' inaction since there are numerous regulations for environmental protection capable to prevent any hazardous effects. Concluding, Greek legislation should include provisions regulating municipal solid waste as RES.

(Abstract: 227 words)

Keywords: climate, renewable energy sources, biomass, municipal waste

I would like to thank Prof. Theodore Panagos for his willing support during the whole period of my dissertation writing.

Eleni I. Giovanopoulou
29.01.2016

Preface

It follows from the theory of relativity that mass and energy are both different manifestations of the same thing – a somewhat unfamiliar conception for the average man. Furthermore $E=MC^2$, in which energy is put equal to mass multiplied with the square of the velocity of light, showed that a very small amount of mass may be converted into a very large amount of energy ... the mass and energy were in fact equivalent.

Albert Einstein

Contents

ABSTRACT	III
PREFACE.....	IV
CONTENTS.....	V
INTRODUCTION	1
REVIEW OF EU CLIMATE – ENERGY POLICIES	3
INTERNATIONAL LEVEL.....	3
EUROPEAN LEVEL.....	4
RENEWABLE ENERGY SOURCES	7
DEFINING RENEWABLE ENERGY SOURCES	7
ADVANTAGES - DISADVANTAGES	7
INCENTIVES.....	9
EU POSITION	9
THE MEMBER STATES ROLE.....	9
PRACTICES TO BE AVOIDED	11
BIOMASS.....	13
BIOMASS DEFINITION	13
COMPARED TO OTHER RES	14
WASTE MANAGEMENT	17
THE LANDFILL DIRECTIVE	17
<i>Regulatory Evolvement.....</i>	<i>17</i>
<i>Benefits of Vertically Integrated System.....</i>	<i>18</i>
THE WASTE MANAGEMENT DIRECTIVE	19
PROCESS OF WASTE TREATMENT	20
AUTHORISATION OF BIOMASS STATION.....	21
GREEK NATIONAL REGIME	21

THE INCONSISTENCIES OCCURRED	22
THE CONSEQUENCES.....	24
ENVIRONMENTAL ISSUES	27
CONCLUSIONS	29
BIBLIOGRAPHY	31
LEGISLATION	31
<i>International</i>	31
<i>European</i>	31
<i>National</i>	31
DOCUMENTS	32
ARTICLES	32
WEBSITES.....	33

Introduction

The energy sector was considered fundamental since the creation of the European Union (hereinafter: EU), being a part, under Art. 194, of the Treaty on the Functioning of the European Union. The objectives settled included the ensurance of the functioning of the energy market and the security of energy supply in the Union, the promotion of energy efficiency, energy saving, the development of new and renewable forms of energy and the interconnection of energy networks, always in the context of the establishment and functioning of the internal market and in the light of the protection of the environment. Due to the fact that Europe's demand of energy is getting higher and higher, nowadays more than half of the energy on demand is supplied from third countries in mostly volatile prices and also the fact that Europe, recently, faced disruptions to supply, the latest years the objectives above became even more crucial and the targets of ensuring energy supply in the Union and establishing a competitive market of low carbon energy came to the first line.

At the same time, EU struggles against global warming. Studies have shown that high concentration of hazardous gases and especially dioxide carbon (CO₂) is to be blamed for greenhouse phenomenon and therefore for temperature increase, showing that the solution is the decrease of CO₂ levels in the atmosphere. Searching the CO₂ sources, it has been found that considerable emissions come from the energy used, during both its generation and its usage, and the waste landfilled. It was then rendered urgent to replace polluting energy sources with conventional so as the emissions be environmentally friendly and to eliminate to the greatest possible extent the waste landfilling.

Sometime, EU realized that both its concerns about energy supply and environment protection were able to be dealt with in common by setting as one of its primary goals the increase of the energy produced by renewable sources, in particular with the use of municipal waste. Greece can play a fundamental role to this energy policy thanks to its natural wealth and its strategic geographic location, while gaining important benefits like the promotion of entrepreneurship, the attraction of investments and the enforcement of Greek economy in general. Nevertheless, Greece suffers a number of deficiencies that hampers its full adjustment to European developments.

In the EU context, a number of directives were published promoting the electricity produced from renewable energy sources, the latest being the Dir. 2009/28, which replaced all the previous ones, and national laws followed in order to harmonize the national legal systems to the European rules. In Greece the base – law for energy issues is 3468/2006, as it's been amended through the years followed by a number of secondary law specifying the general rules of the base-law. The scope of the paper in hand is to discuss the rules on renewable sources of energy (hereinafter: RES), in particular of biomass, on waste management and environmental protection established by both the European law and the Greek national law, to examine whether Greek national law meets the standards expected by European governors. In the end, Greek law will be assessed critically, and amendments will be proposed with a view to promote a vertically integrated system.

REVIEW OF EU CLIMATE – ENERGY POLICIES

The reasons behind creating the EU are the autonomous regulation and the creation of a competitive economy. However, there are regular issues that by definition need global confrontation. One of these is climate change.

International level

It has always been clear that action by the EU alone will not be enough to combat climate change, but action should be taken on international level. This is why the EU entered the United Nations Framework Convention on Climate Change¹, which has been effective since 1994 with the objective to *“stabilize greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system”*².

It was in 1997 when the first decisive step was taken on international level by the 3rd United Nations Climate Change Conference (COP3) for tackling the occurring climate change on the basis that human activities are to be blamed. Kyoto Protocol³ was adopted binding the industrialized countries parties of United Nations framework convention on climate change that ratified it to reduce collectively their emissions of certain greenhouse gases responsible for climate change, including CO₂, by 8% below 1990 levels for States being members of the EU before 2004 and at least 5% for the rest States over the period 2008-2012. Improvements were noted at the following COP15, in the context of which non-binding Copenhagen Accord⁴ was drafted identifying Countries' submitted emissions reductions pledges or mitigation action pledges, and COP16 where Cancun Agreement⁵ was largely accepted committing parties to apply their prior submissions with a view global average temperature not to rise more than 2 degrees Celsius.

It should be noted that decisions taken in the context of international conferences are not full binding international agreements unless they become custom practice through their applications over the years and/or take the form of a treaty. However they constitute soft law, so, although not fully binding, they insert behavior norms usually respected by the parties, with an additional view their consistency to their commitments to be invoked, at political level, during international climate negotiations and contribute to the achievement of an international binding climate agreement in 2015.

Hence, the EU should realize its commitments for reducing its greenhouse gas emissions by 80-95% by 2050 compared to 1990. Accordingly, the 2050 low-carbon

¹ United Nations Framework Convention on Climate Change, United Nations, 2012

² Art.2 Ibid

³ The EU ratified the Kyoto Protocol with Decision 2002/358/EC, OJ L 130 of 15.5.2002

⁴ United Nations Framework Convention on Climate Change, Draft Decision/CP.15, FCCC/CP/2009/L.7, 18.12.2009

⁵ United Nations Framework Convention on Climate Change, Decisions adopted by the Conference of the Parties/CP.16, FCCC/CP/2010/7/Add.1, 15.3.2011

roadmap⁶ set as target 80% emissions reduction, which is going to be achieved through EU transformation into a low carbon economy while midterm indicative milestones for sustainable accomplishment of the ulterior target suggest that by 2040 emissions cuts should be 60%, by 2030 40% and by 2020 25%, in other words more than the relative 30% by 2030 and 20% by 2020 European targets already settled as described below. In the context of the 2050 Roadmap it was assessed that *“If the EU delivers on its current policies, including its commitment to reach 20% renewable, and achieve 20% energy efficiency by 2020, this enable the EU to outperform the current 20% emission reduction target and achieve a 25% reduction by 2020. This would require the full implementation of the Energy Efficiency Plan⁷ presented together with this Communication, which identifies measures which would be necessary to deliver the energy efficiency target.”* given that the reports evaluation until that time had showed that applying that time policies only half of the 20% energy efficiency target would be met by 2020. After all, the priority remains to achieve all the targets already set for 2020.

European Level

In the meantime the EU, adopting the Dir. 2009/28⁸, has committed itself to binding targets to increase the share of energy produced by RES to 20% of the total gross energy consumption in the EU by 2020. In parallel, EU has also set the goals by 2020 to reduce the greenhouse gas emissions by 20% compared to that in 1990, to save 20% of the primary energy consumption noted in a reference scenario where no measures against inefficient use of energy are taken and introduce by 10% the use of biofuels in transport. EU Commission has already launched communications to reform the 20% target of greenhouse gas emissions reduction to 30% by 2020⁹ and the 20% for renewable energy share to at least 27% by 2030¹⁰ and pronounced the proposal of a new Renewable Energy Package in 2016-2017 in order to fulfill its international energy and climate commitments.

Moreover, EU has determined the respective mandatory national targets that are necessary in order the overall European targets to be achieved allowing, though, Member States to reach part of their targets through statistical transfer between them or the implementation of joint projects both between Member States and between Member States and third countries. For a fair and adequate allocation, when determining them, it was taken into account each Member State's different starting

⁶ Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the regions, A Roadmap for moving to a competitive carbon economy in 2050, COM(2011) 112 final, 8.3.2011

⁷ Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the regions, Energy Efficiency Plan 2011, COM(2011) 109 final, 8.3.2011

⁸ Dir. 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC, L 140/16/5.6.2009

⁹ Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions – Analysis of options to move beyond 20% greenhouse gas emission reductions and assessing the risk of carbon leakage, SEC(2010) 650/COM/2010/0265 final

¹⁰ Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee, the Committee of the Regions and the European Investment Bank, A Framework Strategy for a Resilient Energy Union with a Forward-Looking Climate Change Policy, COM(2015) 80 final, 25.2.2015

point, renewable energy potential, the existing level of green energy and the energy mix¹¹. The target as far as it concerns Greece has been settled at 18%¹² green energy share in its energy mix. However, Greece committed itself at 20%¹³.

¹¹ Recital 15, Dir. 2009/28, see note 8

¹² Annex I of the 2009/28 Directive of the European Parliament and of the Council on the Promotion of the use of energy from renewable sources

¹³ Art. 2 par. 3(a) of the law 3468/2006 on electricity generation from RES and cogeneration of high efficiency/performance heat and power (ΦΕΚ 129/Α/27.06.2006) as amended by Art. 1 of the law 3851/2010 (ΦΕΚ 85/Α/4.6.2010)

RENEWABLE ENERGY SOURCES

Renewable energy sources can be exploited so as to substitute polluting and coming to an end fossil fuels. They are of high thermal and electricity capacity, ideal to contribute to confrontation of climate change.

Defining Renewable Energy Sources

To begin with, RES stand out on the basis of their two basic characteristics: a) using RES means that one just exploits, without any human active interference (for example mining, pumping) for the energy production, the existing energy that always flows in the nature and b) they are environmentally friendly because they don't emit hydrocarbons, carbon dioxide (CO₂), or toxic, nuclear or radioactive waste. In order an energy source to be considered as renewable, it should concentrate both these characteristics.

RES are not the only sources of energy with low level emissions of CO₂. Globally, the latest years, the efforts towards the elimination of CO₂ in the atmosphere concentrated mainly in the promotion of natural gas and nuclear power, while RES have noted just a little progress as far as it concerns their proportion in the energy mix¹⁴. On the other hand, in EU it has been noticed that the RES and the natural gas prevail, as energy sources that enter the energy system, over nuclear power, the use of which has been decreased¹⁵. So, nuclear power and natural gas are also environmentally friendly, though without being considered RES, as they need human active interference so as to be used for the energy production. Nevertheless, subject of this paper are only the RES, anything else would exceed its scope.

Hence it seems necessary to define the renewable energy sources. According to Dir. 2003/54¹⁶ the term "renewable energy sources" includes renewable non-fossil energy sources, namely wind, solar, geothermal, wave, tidal, hydropower, biomass, landfill gas, sewage treatment plant gas and biogases. Respectively, the same definition was adopted by law 3468/2006¹⁷, which incorporated the Directive to Greek legal system. However, Dir. 2009/28¹⁸ expands indirectly the term including to "renewable energy sources" also aerothermal, hydrothermal and ocean power in general instead of just wave and tidal.

Advantages - Disadvantages

It becomes obvious that there are numerous alternative energy sources, the use of which is connected with various advantages. Apart from the positive effects upon the environment, they are preferred because they are eternally inexhaustible, in contrast

¹⁴ International Energy Agency, Annual Report 2012

¹⁵ The European Wind Energy Association, Annual Report 2012

¹⁶ Art. 2(30) of the Dir. 2003/54/EC of the European Parliament and of the Council of 26 June 2003 concerning common rules for the internal market in electricity and repealing Directive 96/92/EC, L 176/37/15.07.2003

¹⁷ Law 3468/2006 see note 13

¹⁸ Art. 2(a) of the Dir. 2009/28/EC, see note 8

to the fossil fuels, and they can ensure the energy autonomy even to whole countries. They can also be exploited locally, so there is no need of central huge units of energy production and transfer of energy, which inevitably causes losses of energy.

However, the electricity production based on renewable energy sources costs much more than exploiting conventional sources, basically because of using relatively immature technologies, while as far as it concerns biomass, its high operation costs are also to be blamed. As a result, to date they are not competitive. The business risk augments because of the diminution of energy sales resulting not only by the energy saving policy, but also by the economic crisis.

Both significant research and development efforts and technological and social development are necessary in order to contribute to the costs decrease over time and ensure the absorption of the energy produced from RES. Until then, incentives must be given to producers of energy from renewable sources either in the form of compensation that will cover the cost difference and a reasonable mark-up to offset the high risks of such investments or in any other form that could contribute to that direction.

INCENTIVES

From the early stages of adopting policies for the promotion of RES, EU recognized the necessity of public support with regard to the expansion of electricity produced from RES.

EU Position

Incentives were thought to be necessary at least until electricity prices reflect the full environmental and social costs and benefits of energy sources used¹⁹. RES support mechanisms in the Member States will ensure investor confidence and guarantee fair and stable access to the overall energy market²⁰. Hence the EU provides for a number of incentives that are appropriate for RES energy promotion, indicatively investment aid, tax exemptions or reductions, tax refunds, green certificates, priority to access into transmission and distribution grid, guaranteed access, feed-in-tariffs (FiT) and feed-in-premiums (FiP). In practice, Member States also apply quota systems, tendering systems and long term agreements. At this point, one should distinguish guarantee of origin, which serves solely as proof to a final customer that a given share or quantity of energy was produced from RES, not as an incentive.

The general idea is that the support measures should involve the whole range of RES technologies, not only some specifics, the financial support should include, except for the marginal generation cost, an amount as compensation too, though it should be defined for a certain time frame and the support policy should also encourage research and development of new RES capacities. The RES deployment is also supported by a number of measures, not directed specifically to RES, included in the European Economic Recovery Plan approved by the European Council in December 2008, the most outstanding of which is the creation of the 2020 European Fund for Energy, Climate Change and Infrastructure for the financing of RES enterprises.

However, the expansion of RES, apart from the provision of incentives, depends on the erasure of non-economic barriers as well. For example, limited grid capacity, complex and time-consuming procedures for the approval of RES station establishment, lack of expertised labour and the guarantee of investment security are issues that need to be dealt with immediately.

The Member States role

Nevertheless, the Directive recognizes the decisive role of national policies, as renewable sources are diffusible and therefore can be exploited in a more advantageous way at a regional level and suggests member states to promote local authorities to develop the green energy sector at their regions. Furthermore, each country has discretion to set its own goals and package of support mechanisms which suit best its national energy and overall policy, always in accordance with the minimum

¹⁹ Recital 27 Dir. 2009/28 see note 8

²⁰ Fouquet, Doerte; Johansson, Thomas, European renewable energy policy at crossroads, Energy Policy 36 (2008) 4079-4092

standards settled by the Directive, taking in consideration its weather, social, cultural, economic and investment conditions, the degree of expansion of RES, the RES potentials, the situation of the electricity market and its particularities and needs in general. In particular, each country adjusts the incentives to its dynamic and its national priorities. In any case, it must notify the competent European Committee about the national goals settled, the exact way, in which they are going to be achieved, and, subsequently, to prove the actual application of the measures invoked and its practical effect towards the goals as well, so as the Committee will be able to assess the country's consistency to its commitment and ensure the accomplishment of the broader European goals. However, national policies have the drawbacks that may alter over the short term and differ greatly from country to country and, therefore, it is argued that the dependency on them creates uncertainty and may affect adversely the competitiveness of RES.

It's of vital importance for the expansion of RES to choose effective support instruments. Of course, the most motivating are those providing economic incentives. There are two instruments that grant economic support: the Feed-in-Tariff or minimum price system (hereinafter: FiT) and the quota system. The FiT guarantee fixed prices for the feed-in of electricity produced by RES into the grid, which are defined by public authorities for the specified time frame that lasts the connection to the grid contract (typically 15-20 years) without the obligation, though, to maintain the fixed price at the same level for the renewed contracts or new connections in the following years. Probably a lower fixed price will be offered. On the other hand, where quota system or tradable green certificates (TGC) is applied, the members of the electricity supply chain, be it generator, supplier or consumer, has to present a minimum quantity of certificates each year, which are given per MWh of green electricity generated, supplied or consumed respectively. It is not necessary that obligated parties obtain themselves the certificates, but they buy them on a certificate market on the prices that are being formed by the market from time to time.

The feed-in system features two advantages over TGC. Firstly, it gives incentives to produce the highest quantity of green electricity possible, whereas TGC system limits the quantity that could be installed by setting a minimum quantity as a goal, which once achieved the producers have no more incentive to produce more. Secondly, it is usually accompanied by another incentive, the priority of access to the grid. In general, TGC hasn't been proved very efficient, by the means that it doesn't provide impressive motivation, while support costs substantially exceed the average power generation costs and inevitably consumers pay more, so it is met in just a few countries, such as Sweden and Romania, while other countries like UK, which used to be a major fan of TGC, and Italy apply it in combination with FiT. FiT exhibits significant results in Denmark, Germany and Spain.

Greece adopted FiT system in combination with priority to access. Furthermore, ensures investors at prior stage that once their applications are approved, the operator is obliged to connect the power plant to the grid. Once the connection has been completed, the operator is engaged to conclude energy sale contract with the beneficiary, which will last for at least 20 years. In order to deliver the obligation of erasing non-economic barriers too, adopted law 3851/2010 which focused on

simplifying and shortening the administrative procedures with regard to the various necessary licensing making them at the same time more transparent and therefore fair.

Practices to be avoided

It seems that the incentives provided to RES investors were proved more than effective. The last decade was characterized by the successful deployment of RES across EU Member States – total RES deployment increased by more than 40%²¹. Recently, though, it has been noticed that a number of national policies, including the abolishment of FiT and the freeze on approvals for new projects (in Czech Republic and Spain), the reduction of FiT rates and abolishment of tax exemption for RES investments (in Germany) and legal disputes on support mechanisms (in France, where, according to European Court of Justice, FiT for wind energy consisted state aid violating EU law, which continuously was refuted by European Commission claiming that French support scheme is compatible with Art. 107 TFEU²²) verify, especially in the cases that they apply retroactively, the initial concerns that the dependency on national policies might affect adversely the competitiveness of RES. At the same time, other national policies (like in The Netherlands) didn't provide support adequate to cover the gap between cost prices and market prices²³.

Let's take as case reference Greece. The problem is that Greece, like some other EU member states, made excessive use of this measure, beyond its economic abilities, causing adverse results. When this measure was inserted in Greece for the first time, it reserved particularly high prices for the energy producers using RES²⁴, in particular those who established photovoltaic stations, without provision of the possibility to reform the guaranteed price adjusting them to the cost of RES technologies, which has decreased dramatically since RES technologies have noted important technological improvements and China, which is known for its low cost production, has reinforced its participation in the universal construction industry. The big profit margin led to the rapid RES investments multiplication and, at the same time, to the country's economic incapability to pay the FiT and therefore to the subsequent reduction of FiT, the suspension of licensing new projects²⁵ and the implementation of heavy levies on the existing RES units. Consequently, these changes, for the worse, detriment investors confidence and investment security.

In an effort to prevent such devastating policies, EU published a guide²⁶ for Member States to follow when designing and reforming RES support schemes. In two lines, this guidance recommends that support schemes should be revised being adjusted to falling production costs, even abolished when market conditions mature, but this

²¹ Study on the competitiveness of the EU Renewable Energy Industry (both products and services), Policy Analysis and Sector Summaries, 31 July 2014, European Commission.

²² http://europa.eu/rapid/press-release_IP-14-327_en.htm

²³ See note 21

²⁴ Dr. Doerte Fouquet, Prices for Renewable Energies in Europe: Report 2011-2012 and Report 2009, EREF

²⁵ A.Y./Φ1/οικ.19598/2010 (ΦΕΚ 1630/11.10.2010)

²⁶ Commission Staff Working Document, European Commission guidance for the design of renewable support schemes Accompanying the document Communication from the Commission Delivering the internal market in electricity and making the most of public intervention, SWD(2013) 439 final, 5.11.2013

should be done only gradually, not at once. In particular, financial support should not extend beyond what is necessary. In any case, national policies should not take unannounced or retroactive measures because they threaten investors confidence and future investments.

BIOMASS

Biomass is the most controversial, but at the same time the most effective among RES.

Biomass definition

Biomass may come from agricultural residues (straw, green tops, manure), forestry residues, dairy and food processing wastes, industrial waste and municipal waste. Dir. 2009/28, though, throughout its text emphasizes again and again the excessive uses of biomass and the need to find out new biomass resources²⁷. Whereas the definitions of the most of its sources don't raise further discussions, the municipal waste provokes controversies, as the feedstocks that are included in its definition vary by Member State. As a general definition, more or less acceptable by all member states, municipal wastes that can be used as biomass include household and commercial wastes. Indicatively, they could be composted waste, i.e. the waste produced following treatment, wastewater sludge, refuse derived fuel from mechanical biological treatment plants and non-recyclable waste destined to landfill. Unlike the other biomass feedstocks, wastes' costs negative to 0 USD/GJ, while its plant capacity ranges at the same levels as the rest biomass feedstocks²⁸.

Besides, recent strict regulations on wastes impose great restrictions and exorbitant costs on the use of landfills, including both high tax rates and fines for the violation of the restrictions imposed, which stress mainly municipal authorities, which are designated with waste treatment, to find alternative financially more viable ways to manage wastes. As exposed below, prior practices of landfilling waste in an uncontrolled way were abandoned and since 2006 local authorities that are competent for waste management have to find ways of waste treatment in order to remove biodegradable waste from landfills. In case they don't do so, they have to pay extreme sums as taxes for their use plus penalties.

Therefore, it is extremely important to exceed the municipal waste's definition to as many wastes as possible, in order the vast majority of wastes to be exploited, instead of lying useless in landfills causing, in addition, environmental and fiscal problems. This would be also in conformity to RES Directive which encourages the expansion of biomass.

Although not mentioned directly, law 3468/2006 identifies more categories of biomass through their different prices given at art. 13. Art. 13 puts separately biomass depending on the process it undergoes for its energy recovery and its established rate capacity. The categories recognized are biomass exploited through a) thermal process, excluding the biodegradable fraction with capacity i) lower than 1MW, ii) from 1MW to 5MW, iii) higher than 5MW, b) biological process for biodegradable fraction i) lower than 2MW, ii) higher than 2MW, iii) lower than 3MW and iv) higher than 3MW.

²⁷ Recital 19, see note 8

²⁸ International Energy Agency 2012 annual report

Compared to other RES

In comparison to the other RES, biomass appears more beneficial. One of its most outstanding characteristics is that it constitutes a base load electricity source. This means that it can generate dependable power to consistently meet the minimum level of demand on an electrical grid over 24 hours. Among its advantages are also considered the facts that it can be stored and used in cases of unexpected demand and it works at high capacity utilization rates. Furthermore, it makes use of organic material, which otherwise would be needless, it can contribute to the development of the agricultural sector and thanks to the huge quantities and the constant availability of the organic material, it is possible that biomass will consist the main energy source. Besides, it is already the biggest source of renewable energy representing 10% of total global energy supply²⁹. Nevertheless, EUBIONET III³⁰ study estimated that only 50% of the annual biomass potential, i.e. biomass available but not used, is currently used in the EU.

On the contrary, other RES can be used only supplementary, because they are not always available. For example, solar and wind energy are available only when it is sunny and windy respectively. Another reason why biomass stands out is because its application is not limited to energy generation, but it combines another crucial interest, that of waste management. Given its significance and its perspectives, European Commission estimates that biomass will contribute around two thirds of the share of renewable energy by 2020³¹, which is a demanding expectation stressing for significant biomass development and the diversification of biomass feedstocks. Accordingly, national energy policies are more favorable as far as it concerns biomass supporting it via higher feed-in-tariff, which is its last but not least benefit.

One could say that FiT concerning biomass is established at higher rate compared to the other RES in order to compensate investors for the increased challenges they have to deal with. The truth is that biomass is encumbered with excessive infrastructure and operational costs. To be more specific, biomass requires large quantities of raw material, which have to pass several stages ranging from be sourced, transferred, stored to finally be treated and converted in bioenergy. It goes without saying that each of these stages entails additional costs. No matter biomass is more costly than the other RES, it is still considered important to promote its usage as it exhibits numerous significant irreplaceable aspects. Especially, when it comes for biomass from municipal waste another surcharge is uncertainty about availability of feedstock keeping in mind that Greek legislation eliminates significantly the sense of appropriate municipal waste, as discussed in the following chapters. As a result, it is supported with high FiT, which plays double role: compensation for the increased costs and further incentive for the sake of its considerable merits.

Especially wastes can substitute fossil fuels not only used for industrial practice, but also for energy recovery, on the basis of “waste to energy” concept. Moreover, waste can generate at the same time both electrical and thermal energy. Another important

²⁹ International Energy Agency 2012 annual report

³⁰ EUBIONET III, Solutions for biomass fuel market barriers and raw material availability, 2011

³¹ European Commission Communication (2009), The Renewable Energy Progress Report

advantage wastes offer, is that the biogas they produce, which is further used for energy production, can be transferred or stored, hence it is possible that energy can be generated where or when there is necessity. Accordingly, it is more than appropriate for energy production on emergency occasions.

WASTE MANAGEMENT

The sector of waste management can also play decisive role to the elimination of greenhouse gas emissions.

The Landfill Directive

Regulatory Evolvement

The last decades a remarkable increase of the amounts of municipal waste had been noticed. The reasons lying behind this increase vary but they are mainly connected with the formation of big city centers, the improvement of living standard and the evolvement of consumer habits. Every year two billions tonnes of waste are produced in Europe, including the hazardous waste, while it is expected that in 2020 the wastes will have been increased by 45% compared to 1995³² with the consequent relative environmental problems, mainly emissions of CO₂.

In the past, all waste ended up to landfills of uncontrolled disposal, without any prior separation or other treatment, where they were landfilled for ages until their decomposition. This method of waste management was proved extremely harmful for the environment. During their stay there, they are draining producing particularly polluting liquid secondary waste which were absorbed by the soil and channeled to the groundwater table diminishing the reserves of drinking water. At the same time, they release dangerous biogas containing incredible polluting methane³³. This already burdened situation was getting even worse and menacing for public health whether hazardous, toxic or other infectious waste were also landfilled or in cases of fire where more harmful substances are released and human lives, properties and forests get in danger. As a collateral result, large areas were restricted to serve as landfills and the price of the land there decreases and it becomes blighted area.

In 1999 the Landfill Directive³⁴ set the target to progressively reduce the amount of biodegradable municipal waste landfilled regulating their obligatory removal since 2006 and permits landfilling only for the residues remaining after waste treatment. In parallel, it inserts the “*waste to energy*” concept and the obligation for recycling and landscape restoration. Since then landfills of uncontrolled disposal are illegal and governments are engaged to ensure the sorting of biodegradable fraction of waste at source and the establishment of waste treatment units. The Landfill Directive was incorporated in Greek legislation with ministerial decision 29407/3508/2002³⁵ which regulated that waste disposal is forbidden unless they undergo some treatment, i.e. any physical, thermal, chemical or biological process for their minimization, the elimination of their polluting substances and the exploitation of their useful fraction. Therefore, the sense of treatment includes the separation at source, sorting, shredding and any other technology applied for the physical, thermal, chemical or biological

³² www.oecd.org

³³ Methane (CH₄) is 21-23 times more polluting than dioxide carbon (CO₂)

³⁴ Dir. 99/31/EC

³⁵ Ministerial decision 29407/3508/2002 for measures and conditions for waste landfilling ΦΕΚ 1572/Β/2002

waste treatment, for example incineration, combustion, gasification, pyrolysis, composting, anaerobic digestion and biological drying.

Therefore, the next stage involved the transition from landfills of uncontrolled disposal to establishments that have the appropriate infrastructure for waste treatment in order to satisfy the obligation for waste treatment and the future restoration of the landscape. The new generation landfills differ to the extent that both liquid and gas secondary waste are collected and treated, a soil surface sealing is established and the incoming waste are controlled in order not to contain hazardous, toxic or other infectious waste. Although its advantages were important, there were still some disadvantages that needed to be effaced, like the decrease of the price of land, the degradation of the area and the fact that no waste was recovered, not to mention the high costs for the treatment of liquid and gas pollutants.

Benefits of Vertically Integrated System

Primarily, it should be mentioned that a vertically integrated system would achieve the goals settled by EU for the elimination of the emissions to the atmosphere of polluting substances that cause the greenhouse effect, and further the climate change.

In case they start being used as biomass for energy production, there will be plenty various benefits in more than one sector. Firstly, Municipalities are going to resolve important issues. Namely, they will get rid of dozens of tones of waste, which otherwise would be driven to the sanitary landfills. This way, they ensure the low percentage of waste that end up to the sanitary landfills and, consequently, they avoid being condemned to heavy fines, while they give a permanent solution to the lack of space that could serve as sanitary landfills. Even the existing ones, in the long term, may be transformed in green areas. In parallel, Municipalities will enjoy economic benefits. They will be autonomous as far as it concerns the energy they consume, they will stop buying energy at high prices and, at the same time, they will gain profits selling the energy they produce. Specifically rural Municipalities can also enforce their economy based on primary sector, on the one hand by the means of taking advantage of the biofertiliser that results from the process of biomass in order to enrich the rural fields and enhance the local productivity and, on the other hand, of promoting the cultivation of energy crops which support the energy production out of waste, in other words the cultivation of plants that, after appropriate processing, get mixed with waste facilitating the energy production.

Furthermore, the benefits of a vertically integrated system exceed to several other aspects of everyday life. Except for the Municipalities, the citizens enjoy important advantages as well. They pay less for municipal fees, which will be reduced by the amount that was previously necessary for the storage of the waste in the sanitary landfills. Additionally, the establishment of units of energy production from waste will automatically create a number of jobs, for example employees responsible for the waste sorting, engineers, chemical engineers, drivers for the waste transfer, computer technicians, guards. Among the advantages of a vertically integrated system are also included the district development of the country through the enforcement of local economies.

The Waste Management Directive

Although the amount of biodegradable municipal waste landfilled had been reduced³⁶, the waste generation continued increasing. Europe set the target to deter this situation by reducing the volume of waste that are produced, by reusing the waste through their recovery and recycling and apply effective methods of waste management. Through the years, there was a standstill factor that impeded the efforts towards these targets. It was the regulations' vagueness, which provoked the adoption of numerous separate provisions, either superior or interpretative, for the supplement of the initial vagueness and then the multitude of laws, legislative complexity and many legal disputes. In turn, uncertainty prevailed and the investments were discouraged.

Under these conditions, the European Commission prioritized the simplification of European legislation on waste management, so Directive 2008/98/EC³⁷ was adopted. Its basic principles are the protection of health and of the environment when managing waste, hierarchy of the ways of waste management, proximity in the sense that waste must be disposed the closest possible to their origin in order to eliminate their transfer, waste disposal principally to the member state where produced, in any case in the context of EU, the waste producer's responsibility to restore any environmental damage at the waste disposal area and the design of the products in such a way as to be able to be recovered or recycled.

However, the principle of hierarchy must be distinguished, as the interface between waste management and use of RES setting the priorities when forming the waste management policy. In line with waste directive, the policies should primarily focus on the prevention of waste, after that preparing for re-use, then on recycling, followed by other recovery methods, including energy recovery, leaving as last resort the recourse to the final disposal of waste³⁸. Nevertheless, the Directive leaves space for national policies discretion, allowing them to differentiate from this hierarchy with a view to deliver the best overall environmental outcome taking into account the general environmental protection principles of precaution and sustainability, technical feasibility and economic viability, protection of resources, as well as the overall environmental, human health, and economic and social impacts³⁹.

One could say recycling, which lies at upper priority level, is restrained by energy recovery. Assessing, though, environmental and economic factors, policies usually end up to the same direction, the prioritization of the energy recovery over recycling under certain conditions. In order to assess in each case which method of waste management prevails, consideration of both hierarchy principle and environmental, economic and social factors take place. In Greece the combustion of mixed municipal waste, for example, cannot be considered as priority neither under the waste management directive nor the RES promotion directive as mixed waste are not

³⁶ In 2010 37% of municipal solid waste was landfilled, instead in 2013 38% is recycled and composted and 21% is incinerated, available at http://www.eea.europa.eu/data-and-maps/indicators/#c5=waste&c0=10&b_start=0

³⁷ Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives, EE L 312/3/22.11.2008

³⁸ Art. 4 par. 1 Dir. 2008/98/EC

³⁹ Art. 4 par. 2 Dir. 2008/98/EC

recognized as RES, unless it achieves high energy capacity rates, i.e. more than 65%, in which exclusive case it falls into the scope of energy recovery.

Process of Waste Treatment

At this point, it would be useful to present the course of municipal solid waste according to the current regime. Ideally waste management involves an initial supplementary stage where municipal waste are separated at source enforcing recycling while in parallel reducing final waste disposal. Whereas there is relative legislative provision⁴⁰ including even biodegradable fraction of waste separation at source, it has not been implemented yet. Given that waste separation at source is not popular in Greece, in the beginning, the municipal wastes are mixed. Following either mechanical biological or biological mechanical treatment is applied. As it becomes obvious from their definition they differ as far as it concerns the sequence mechanical and biological treatment take place. Whether mechanical biological technology is preferred, after waste collection and preparation, mechanical sorting takes place, where recyclable and biodegradable waste get separated, followed by further, thermal or biological, treatment as exposed beyond. The secondary fuel produced during these procedures is RDF. On the contrary, when biological mechanical technology is applied, biological treatment precedes mechanical sorting, which means that at the stage of sorting no solid biodegradable fraction is left to be further treated. In this case SRF are produced. As a result, the meaningful differences between these technologies concern their capacity to provide biodegradable fraction and the quality of secondary fuels produced, whereas both of them provide recyclable waste.

According to mechanical biological method, mixed waste, once prepared after their collection, are separated through sorting into recyclable and those, to some point still mixed waste, capable of energy recovery. During their storage and treatment when being sorted and shredded, mixed wastes release secondary fuels of high calorific value, i.e. RDF and SRF. Mixed waste, depending on their biodegradable fraction, they undergo either thermal or biological treatment. Primary mixed waste and secondary fuels released during the previous treatment stages, containing, but not exclusively consisting of, biodegradable fraction are treated through thermal methods, namely incineration - combustion, gasification and pyrolysis with a view to transform into liquid, gas and solid products and release thermal energy, which will be finally disposed at new generation landfills with infrastructure for the waste treatment.

Biodegradable waste undergo, instead of thermal, biological treatment, i.e. composting or anaerobic digestion. Of course, biodegradable waste separated at source is of much higher quality and efficiency than that sorted from mixed waste. It depends on the latter's quality and the technologies applied for their sorting. In every case, though, the substance they produce is still considered biomass. Composting gives directly biomass. In the context of anaerobic digestion, biomass is produced through the treatment of the digestate remaining as residue after biogas production, also used for energy generation.

⁴⁰ Law 2939/2001 for packages and alternative treatment of packages and other products (ΦΕΚ 179/Α/6.8.2001)

AUTHORISATION OF BIOMASS STATION

Greek National Regime

In general, according to Greek law, the establishment of a biomass station takes place according to the same rules and procedures as those applied for the rest RES. The very first step requires the approval by RAE of energy generation license, which prerequisites that the project meets the predefined criteria of national security, protection of public health and security, the general safety of the establishment and the relevant equipment of the System and the grid, satisfactory capacity utilization rates, the maturity of the project implementation, the applicant's capacity to implement the project on the basis of scientific and technical sufficiency and the possibility to ensure the necessary funding, the provision of services of general interest, the possible materialization of the project in accordance with the rules on land use plan and sustainable development of RES and the compatibility of the project with the National Action Plan concerning the policies that will be applied for the achievement of the European targets for RES deployment.

The acquisition of energy generation license is not obligatory for biomass plants with established electrical capacity up to 1 MW. Anyway energy generation license approval doesn't mean that the biomass plant exempt from the obligation to get also approval of environmental conditions and permission for its establishment and operation. Besides, the generation license constitutes prerequisite for even applying for the rest necessary approvals. In particular, the generation license is followed by the applications to the competent operator for connection offer and to the competent authority for environmental conditions approval and, if it is the case the power plant to be established at forestry region or seaside or in the sea, application for their use allowance should also take place.

After the previous processes have been accomplished and the connection offer becomes binding, the beneficiary proceeds to the application for establishment permissions, the conclusion of connection contract and then the conclusion of sale contract. The beneficiary, who has established the power plant and after a trial period, applies for operation permission. The latter is granted on the condition that the competent authority ascertains that during the trial period the power plant fulfilled the necessary technical conditions and equipment appropriateness.

The power plants that exempt from the generation license obligation, i.e. those with established electrical capacity up to 1 MW, exempt from the obligation for establishment and operation permissions, they are still engaged, though, to the environmental conditions approval. There are some limited occasions where neither environmental conditions approval is necessary. Nowadays, none biomass plant falls into the scope of these limited exemption, although in the past biomass units with capacity up to 0,5 MW used to be included in the exemptions.

When RAE examines, at first instance, an energy generation license application for the establishment of a biomass station, it takes in consideration, except for the general

criteria above, which have to be fulfilled no matter what kind of RES station is going to be established, also an extra specific criterion that has to do with the feedstock that is going to be used at the biomass station for the energy production. Firstly, law 3468/2006 authorized the Ministry of Environment and Energy for the energy generation licensing after RAE had assessed the application and provided just its -not binding- opinion. Subsequently, law 3468/2006 was amended by law 3851/2010 for the acceleration of the licensing process, authorizing since then RAE to directly publish the energy generation license without any prior consultation from any office or any mediation of the Ministry of Environment and Energy. While the general rules form part of the already mentioned law 3468/2006, these rules are specified and supplemented by ministerial decisions, according to which the competent authority publishes the energy generation license. The first such decision⁴¹ did not include at all specific rules on biomass. Biomass was about to be specifically regulated under the new ministerial decision that adjusted the licensing proceeding to the amendments brought by law 3851/2010.

The initial proposal, on behalf of RAE, for the new ministerial decision included a separate chapter on biomass station licensing. According to the rules incorporated under the subtitle “Applying and Assessment of applications for licensing stations using treated solid waste (RDF & SRF) as feedstock”, *“The applications for licensing biomass stations using as feedstock municipal wastes in the meaning of art. 2 par. 8 of law 3468/2006, are submitted pursuant with the process provided for under art. 3 ... Assessing these applications, when it comes to examine the criterion of capacity utilization rates, it will be assessed on the grounds of the biodegradable fraction of municipal solid waste, which will have to be equal to 100% with the slight possibility to diverge up to 3% based on the scientific rules regarding measurement. In case the biodegradable fraction of municipal solid waste is lower than the limits settled at the previous phrase, the application will be assessed not as application for biomass station but as application for cogeneration plants of high efficiency heat and power”*.⁴²

The Inconsistencies Occurred

In brief, this provision introduced particularly strict regulation restricting the biomass that could be recognized and, therefore, assessed and licensed as RES to municipal solid waste consisting of 100% biodegradable fraction. In other words, unless the station uses 100% biodegradable fraction, it is not licensed as RES station. This way, though, it excluded a significant part of municipal waste from biomass’ definition and therefore from RES, for example the mixed waste, even the secondary products coming from solid waste that has been treated, namely refuse-derived fuel (RDF) and solid recovered fuel (SRF)⁴³, whereas at least the latter had been mentioned in the context of the title of the proposed article under discussion. Excluding not sorted

⁴¹ Δ6/Φ1/οικ.5707/13.03.2007(ΦΕΚ 448/Β/2007)

⁴² Art. 33 of RAE Proposal for the new Regulation on RES stations and station which generate at the same time both electricity and heat at high capacity utilization rates.

⁴³ RDF are secondary fuels produced from the mechanical treatment of solid municipal or industrial waste with high calorific value, capable to substitute solid fossil fuels, which include biodegradable and therefore biomass fraction, but they don’t always consist of 100% biodegradable fraction. SRF are the RDF produced from non hazardous waste meeting the qualifications standard EN 15359 defined by CEN/TC 343.

waste further means that the only feedstock that can be used is that coming from recycling establishments where waste sorting takes place. As a result, the excluded waste mentioned could be assessed only as feedstock for stations that generate at the same time both electricity and heat at high capacity rates. It could not be assessed as RES partly at least for the percentage of the biodegradable fraction it included.

Considering it step by step, its wording seems internally contradictory. Although its title refers expressly to stations using treated solid waste (RDF & SRF) as feedstock, the text refers to stations using municipal waste in the meaning of art. 2 par. 8 of the law 3468/2006⁴⁴, i.e. biomass, i.e. further the biodegradable fraction of products, waste and residues from biological origin from agriculture (including vegetal and animal substances), forestry and related industries including fisheries and aquaculture, as well as the biodegradable fraction of industrial and municipal waste. The thing is that, whereas the provision above treats RDF & SRF and biomass as identical, these feedstocks don't always match. Specifically, biomass can also be found in waste having other form than RDF or SRF and, conversely, it doesn't go without saying that RDF and SRF consist exclusively of biomass, but there are cases biomass holds only part of them.

However, this provision was generally defective, but, most of all, it was incompatible to superior international, European and national regulations and contrary to foreign national laws and of course contrary to international practices.

Dir. 2001/77/EC⁴⁵ was clear about not supporting non-separated municipal waste. It was included in its wording that *“Support for renewable energy sources should be consistent with other Community objectives, in particular respect for the waste treatment hierarchy. Therefore, the incineration of non-separated municipal waste should not be promoted under a future support system for renewable energy sources, if such promotion were to undermine the hierarchy”*. Nevertheless, Europe has abandoned its previous refusal upon non-separated municipal waste. Not only it didn't include such statement, but also emphasized throughout its text that it is necessary to expand the use of biomass and find new source of biomass.

Moreover, Dir. 2009/28 also mentioned that *“In order to reduce greenhouse gas emissions within the Community and reduce its dependency on energy imports, the development of energy from renewable sources should be closely linked to increased energy efficiency”*⁴⁶ and continued that *“The coherence between the objectives of this Directive and the Community's other environmental legislation should be ensured. In particular, during the assessment, planning or licensing procedures for renewable energy installations, Member States should take account of all Community environmental legislation and the contribution made by renewable energy sources*

⁴⁴ The meaning of biomass under law 3468/2006 is the same of that given under art. 2(e) of Dir. 2009/28

⁴⁵ Recital 8 of the Dir. 2001/77/EC of the European Parliament and of the Council of 27 September 2001 on the promotion of electricity produced from renewable energy sources in the internal electricity market, L 283/34/27.10.2001

⁴⁶ Recital 5 of the Dir. 2009/28, see note 8

towards meeting environmental and climate change objectives, in particular when compared to non-renewable energy installations”⁴⁷.

As far as it concerns RDF/SRF, their importance regarding their energy efficiency and ability to contribute to greenhouse gas emissions reduction have been analyzed thoroughly above. Given that they play decisive role for the goal for greenhouse gas emission reduction and those settled by Landfill Directive too concerning energy recovery to the greatest possible extent and the elimination of waste ending up to be landfilled, their exclusion from RES meaning is absolutely contradictory to European policies. Accordingly, it becomes obvious from the above that the new RES Directive supports RDF/SRF as RES and it would contravene its spirit if one went on a different interpretation.

Furthermore, the wording of the initial proposal of this secondary rule is contrary even to the provisions included in national law 3468/2006. The latter expressly states that secondary fuels are considered biomass. It is art. 13 that states out clearly the categories of RES, giving them prices, and as mentioned above some of the categories reflect the secondary fuels, without the biodegradable fraction, and the biofuels.

The Consequences

Consequently, RAE after considering the above mentioned, proposed the amendment of its initial regulation proposal⁴⁸. This time proposed the minimum proportion of biodegradable fraction necessary for the energy generation license approval should descend to 65%. Nevertheless, RAE concluded that this controversial issue under discussion could be subject of the policy regarding waste management. In addition, the period when regulation on licensing was about to be adopted coincided with the period of final formation of the law incorporating to national legislation the waste management directive. In case the final law includes provisions on the matter, different from those adopted by the ministerial decision on license regulation, the latter, as secondary law, should then be amended and adjusted to the law provisions. So RAE, in order to avoid this inconsistency, proceeded to a second alternative proposition, no certain biodegradable fraction proportion to be specified, but to spell it out with reference to the specific provisions under waste management law. Eventually, the final ministerial decision excluded the whole chapter on biomass units, accepting that the issue was up to waste management policy. However, nor the law on waste management included relative provisions at all.

It should also be highlighted that according to Greek public law, unlike private law which allows doing anything under the condition that is not forbidden, the competent authorities are authorized to proceed to certain actions only when they are expressly allowed or indicated by the law. Accordingly, RAE is authorized to license a RES station under the condition it finds that the station fulfills the requirements settled under the RAE Regulation for giving permission for energy production with the use of RES and through cogeneration of high performance power and heat. Since it has not been published any regulation interpreting that biomass station license is possible to be

⁴⁷ Recital 44 of the Dir. 2009/28, see note 8

⁴⁸ RAE opinion No. 21/2011

given independently the share of biodegradable fraction or defining the necessary share at a lower percentage than 100% with supplementary provision that it will be recognized as RES only for the share of its biodegradable fraction, RAE approves as biomass stations only those using municipal solid waste consisting of 100% biodegradable fraction. The rest applications are approved as cogeneration of high performance power and heat units.

Not surprisingly, to date, only a limited number of such biomass stations have managed to obtain permission⁴⁹ because of the legislation gap. This situation entails, except for the inconsistencies with superior regulation and global practices mentioned before, a number of noteworthy issues. In general, the cogeneration establishments don't fall within the scope of the legislation regarding specifically RES.

By not recognizing mixed municipal waste as RES for the percentage of biodegradable fraction they contain but regulating only the potential these plants to be permitted as cogeneration of high efficiency heat and power stations, in fact this policy encourages investors to concentrate large amounts of mixed waste at large scale plants in order to be able to fulfill the high capacity rate requirement. This way, though, they remove from the market a significant proportion of waste, which otherwise could be separated, recycled and treated, eliminating the waste availability for other small or medium scale but more energy efficient RES units. Subsequently, the low availability of biodegradable waste in combination with their high demand leads their prices to soar. In parallel, this kind of policy violates the proximity principle governing waste management.

Furthermore, the exclusion of mixed waste, RDF and SRF from RES meaning, hampers the achievement of the targets set by RES Directive, as the energy generated out of these, if any, since not characterized as green energy, is not counted in when calculating the energy produced from RES at national level. In addition, the secondary fuels continue to end up to landfills preventing to achieve the target to reduce the waste landfilled.

⁴⁹ www.rae.gr

ENVIRONMENTAL ISSUES

The main reason hidden behind negative public attitude, which -at great extent- influences governmental policies, towards energy recovery via waste treatment is the reactions on behalf of environmental organizations. Although they accept as biomass the absolute biodegradable fraction coming from separation at source and through biological waste treatment, they invoke hazardous gas emissions when it comes for secondary fuels, i.e. RDF and SRF. Taking for granted that incineration or co-incineration of even harmless waste may cause, depending on the waste quality, emissions of polluting substances, they claim that RDF and SRF release such polluting substances because of their low quality due to their origin from mixed waste, taking into account that the quality of fuel and other gas substances released depends on the waste's quality and composition.

In response to these concerns, European authorities composed the CEN/TC 343 committee with the objective of *“elaboration of standards, technical specifications and technical reports on solid recovered fuels (RDF, etc.) prepared from non hazardous waste to be utilized for energy recovery in waste incineration or co-incineration plants, excluding those fuels that are included in the scope of CEN/TC 335 Solid Biofuels (prepared from hazardous waste)”*. The committee working in groups published, among others, standards EN 15359:2011 on specifications and classes, EN 15440:2011 indicating methods for the determination of biomass content and CEN/TR 15591:2007 determining the biomass content based on the 14C method. In general, the conclusions are RDF/SRF consists of 45-70% biodegradable fraction contributing to CO₂ emissions reduction, it can be used as an alternative method of waste management which results in energy recovery and it can substitute other polluting solid fuels like lignite with vast industrial applications.

The validation of RDF to SRF reassures -partly- the environment proponents regarding the environmental consequences while enhances the public confidence, enforce its commercial value and initiates private investors to improve their technologies and product.

Additionally, there is no reason for such environmental worries if governments make sure that biomass plants will comply with all regulations adopted, apart from the above mentioned Landfill, Waste management and RES Directives with their relative national rules which include environmentally friendly provisions as well, for the environmental protection. At first place stands the general law 1650/1986 that categorize the projects depending on their harmful effect upon the environment.

Besides, the ministerial decision 22912/1117/2005⁵⁰ incorporating Dir. 2000/76/EC⁵¹ for waste incineration which impose strict measures and conditions regarding the delivery and reception of waste, their operation, water discharges from the cleaning of

⁵⁰ KYA 22912/1117/2005 (ΦΕΚ 759/Β/06.06.2005) on measures and conditions for the prevention and limitation of environmental pollution caused by waste incineration

⁵¹ Dir 2000/76/EC of the European Parliament and of the Council of 4 December 2000 on the incineration of waste, Official Journal L 332, 28.12.2000, P. 0091-0111

exhaust gases and, of course, determine air emissions limit values. Even combustion plants, when their capacity is equal to or more than 50MW, independently of the kind of the feedstock used, have to conform to environmental restrictions defined with Dir. 2001/80/EC⁵² and the consequent ministerial decision 29457/1511/2005⁵³ dealing with large scale combustion plants.

It would be impossible for a biomass plant to grant the approval of environmental conditions necessary for its establishment and operation, in the case that it did not meet the prerequisites set by the above mentioned regulation.

⁵² Dir. 2001/80/EC of the European Parliament and of the Council of 23 October 2001 on the limitation of emission of certain pollutants into the air from large combustion plants, Official Journal L 309, 27.11.2001, P. 0001-0021

⁵³ KYA 29457/1511/2005 on measures and conditions for the limitation of emission of certain pollutants into the air from large combustion plants (ΦΕΚ 992/Β/2005)

Conclusions

It has been many years that Europe, even in cooperation with international bodies tackles against climate change. In the context of this effort it has adopted a number of significant regulations binding its Member States to promote the use of RES and minimize the amount of waste landfilled, while apply the waste to energy concept. It should be noted that, according to EU biomass coming from solid municipal waste can play a decisive role to the achievement of its targets. Moreover, it makes it clear that there is need to find out new source of biomass. Consequently, any policy not including the existing sources to the meaning of biomass and therefore limits it instead of expanding it is contradictory to the superior European rules.

Bibliography

Legislation

International

- United Nations Framework Convention on Climate Change, Draft Decision/CP.15, FCCC/CP/2009/L.7, 18.12.2009
- United Nations Framework Convention on Climate Change, Decisions adopted by the Conference of the Parties/CP.16, FCCC/CP/2010/7/Add.1, 15.3.2011
- United Nations Framework Convention on Climate Change, United Nations, as amended in 2012

European

- Council Directive 1999/31/EC of 26 April 1999 on the landfill of waste, L 182,16/07/1999 P. 0001-0019
- Dir. 2001/77/EC of the European Parliament and of the Council of 27 September 2001 on the promotion of electricity produced from renewable energy sources in the internal electricity market, L 283/34/27.10.2001
- Dir. 2001/80/EC of the European Parliament and of the Council of 23 October 2001 on the limitation of emission of certain pollutants into the air from large combustion plants, Official Journal L 309, 27.11.2001, P. 0001-0021
- Decision 2002/358/EC Council Decision of 25 April 2002 concerning the approval, on behalf of the European Community, of the Kyoto Protocol to the United Nations Framework Convention on Climate Change and the joint fulfillment of commitments thereunder OJ L 130 of 15.5.2002
- Dir. 2003/54/EC of the European Parliament and of the Council of 26 June 2003 concerning common rules for the internal market in electricity and repealing Directive 96/92/EC, L 176/37/15.07.2003
- Dir 2000/76/EC of the European Parliament and of the Council of 4 December 2000 on the incineration of waste, Official Journal L 332, 28.12.2000, P. 0091-0111
- Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives, EE L 312/3/22.11.2008
- Dir. 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC, L 140/16/5.6.2009

National

- Law 1650/1986
- Law 2939/2001 for packages and alternative treatment of packages and other products (ΦΕΚ 179/A/6.8.2001)
- ministerial decision 29407/3508/2002 for measures and conditions for waste landfilling, ΦΕΚ 1572/B/2002

- KYA 22912/1117/2005 (ΦΕΚ 759/Β/06.06.2005) on measures and conditions for the prevention and limitation of environmental pollution caused by waste incineration
- KYA 29457/1511/2005 on measures and conditions for the limitation of emission of certain pollutants into the air from large combustion plants (ΦΕΚ 992/Β/2005)
- Law 3468/2006 on electricity generation from RES and cogeneration of high efficiency/performance heat and power (ΦΕΚ 129/Α/27.06.2006)
- Δ6/Φ1/ΟΙΚ.5707/13.03.2007(ΦΕΚ 448/Β/2007)
- Α.Υ./Φ1/ΟΙΚ.19598/2010 (ΦΕΚ 1630/11.10.2010)

Documents

- European Commission Communication (2009), The Renewable Energy Progress Report
- Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions – Analysis of options to move beyond 20% greenhouse gas emission reductions and assessing the risk of carbon leakage, SEC(2010) 650/COM/2010/0265 final
- Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the regions, A Roadmap for moving to a competitive carbon economy in 2050, COM(2011) 112 final, 8.3.2011
- Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the regions, Energy Efficiency Plan 2011, COM(2011) 109 final, 8.3.2011
- EUBIONET III, Solutions for biomass fuel market barriers and raw material availability, 2011
- Commission Staff Working Document, European Commission guidance for the design of renewable support schemes Accompanying the document Communication from the Commission Delivering the internal market in electricity and making the most of public intervention, SWD(2013) 439 final, 5.11.2013
- Study on the competitiveness of the EU Renewable Energy Industry (both products and services), Policy Analysis and Sector Summaries, 31 July 2014, European Commission.
- Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee, the Committee of the Regions and the European Investment Bank, A Framework Strategy for a Resilient Energy Union with a Forward-Looking Climate Change Policy, COM(2015) 80 final, 25.2.2015
- International Energy Agency, Annual Report 2012
- The European Wind Energy Association, Annual Report 2012
- RAE Proposal for the new Regulation on RES stations and station which generate at the same time both electricity and heat at high capacity utilization rates

Articles

- Diakoulaki Danai, The Energy Sector in Greece during the crisis: challenges and perspectives

- Doerte Fouquet; Johansson, Thomas, European renewable energy policy at crossroads, Energy Policy 36 (2008) p. 4079-4092
- Doerte Fouquet, Prices for Renewable Energies in Europe: Report 2011-2012 and Report 2009, EREF
- European Environment Agency Briefing No. 02/2005 "How much biomass can Europe use without harming the environment?", ISSN 1830-2246
- Mirkou Katerina, Energy produced by Secondary Fuels (RDF/SRF)
- Tsola Sofia, Biomass and Renewable Sources of Energy as the Way to Deal With Energy Problem

Websites

- http://europa.eu/rapid/press-release_IP-14-327_en.htm (last visited on 30.01.2016)
- www.oecd.org (last visited on 30.01.2016)
- http://www.eea.europa.eu/data-and-maps/indicators/#c5=waste&c0=10&b_start=0 (last visited on 30.01.2016)
- www.rae.gr (last visited on 30.01.2016)

